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ABSTRACT

Twenty third-grade teachers and their low ability reading group students participated in a naturalistic study to test how teachers' explanations during a year of reading instruction affected either metacognitive awareness or student use of strategies while reading. The 10 teachers in the treatment group were trained to be explicit when teaching low ability groups to use reading skills as strategies; the remaining 10 served as a control group. The first group was observed 12 times and the second was observed 6 times. The first hypothesis was that treatment teachers would provide more explicit explanations about how to use reading skills as strategies than the control teachers. The second hypothesis was that the low-group students of the treatment teachers would demonstrate more awareness of lesson content and of the need to be strategic when reading and greater reading achievement gains. Statistically significant results confirmed the hypotheses regarding explanation, awareness, and achievement; teachers were able to become more explicit in explaining reading skills strategies; students did respond to the explanations; and the explanations led to better achievement test scores. These findings indicate that explanation is important because it makes students more consciously aware of the content of their lessons. Also important are the possible linkages between explicit explanations, student cognitive processing of instructional information, and achievement. (References and eight appendixes providing the rating criteria and other measures used in the study are included.) (SKC)

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Research Series No. 181

THE EFFECT OF DIRECT EXPLANATION OF READING STRATEGIES ON LOW-GROUP THIRD GRADERS' AWARENESS AND ACHIEVEMENT: A TECHNICAL REPORT OF THE 1984-85 STUDY

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Abstract

Results of prior research indicate that metacognitive awareness of reading strategies distinguishes good readers from poor readers and that such awareness can be taught. It is not known, however, how teachers' explanations during reading instruction affect either metacognitive awareness or student use of strategies when reading. The experiment reported here was designed to study these effects in actual classroom settings. Twenty third-grade teachers and their low reading group students participated. Teachers were randomly assigned to one of two groups. The 10 teachers in the treatment group were trained to be explicit when teaching low reading groups to use reading skills as strategies; the remaining 10 served as a treated control group. Researchers hypothesized first that treatment teachers would provide more explicit explanations about how to use reading skills as strategies than treated control teachers. They then hypothesized that the low-group students of the treatment teachers would demonstrate (a) more awareness of lesson content and of the need to be strategic when reading and (b) greater reading achievement gains as determined by traditional and nontraditional measures. Statistically significant results confirmed the hypotheses regarding explanation, awareness and achievement. The importance of explanation is discussed as well as the possible linkages between explicit explanations, student cognitive processing of instructional information, and achievement. Implications for instructional practice and for future instructional research are suggested.

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Laura R. Roehler, Gerald G. Duffy, Joyce Putnam, Roy Wesselman, Eva Sivan, Gary Rackliffe, Cassandra Book, Michael Meloth and Linda Vavrus[1]

Research on reading instruction traditionally examines the relationship between instruction and student achievement as measured by tests. Recently, however, scholars have suggested that students cognitively mediate instruction, forming a bridge between instruction and achievement on tests (Doyle, 1983; Winne, 1985). The study reported here is based on this concept and focuses on (a) whether students who receive explicit teacher explanations of the mental processes associated with using skills as strategies mediate lesson content in ways which result in more awareness and (b) whether such explanations are also associated with greater student achievement gains.

Background To This Line Of Research

This research report, the fourth in a series of studies of teacher explanation conducted in each of the academic years between 1981 and 1985, describes the rationale for this line of research, the similarities

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across the four studies, the results of the first three studies, and the distinctive features of this line of instructional research.

Rationale for the Line of Studies

This research, focused on teaching low-group students to use reading skills as strategies, is based on recent comprehension research that emphasizes the strategic nature of reading (Brown, 1981; Paris, Lipson, & Wixson, 1983; Pressley, Forest-Pressley, Elliot-Faust, & Miller, 1985) and the relationship between metacognition and performance (Baker & Brown, 1984; Flavell & Wellman, 1977). As described by Johnston (1983), "Reading comprehension is considered to be a complex behavior which involves conscious and unconscious use of various strategies" (p. 17). Such strategy usage requires readers to be aware of the cognitive activities they engage in when reading and to be able to control these activities (Baker & Brown, 1984). When the conceptual load or the structure of a text is complex and comprehension breaks down, good readers first become aware of the breakdown and then control it by using strategies to repair the breakdown and to continue reading.

Pressley (in press) calls these "specific strategies." They include "goal specific strategies," such as determining word meaning using context clues or drawing conclusions which readers use to understand text; "monitoring strategies," used to keep track of whether text is making sense; and "higher order sequencing strategies" which are plans employing both monitoring and goal specific strategies to remove a blockage. Expert readers use such specific strategies when the need arises; poor readers do not. One of the teacher's important tasks, then, is to teach students (a) the awareness needed to monitor comprehension activities and (b) how to control comprehension by engaging in the mental acts associated with

using specific strategies to restore meaning. Past instructional studies in reading have not focused on teaching the mental acts of strategic reading in this way (Roehler, Duffy, & Meloth, 1986).

The intent of this line of research was to determine the effect of explaining to students the mental processing associated with such strategies. Because each student's cognitive mediational activity determines in large part what is attended to, interpreted, acted upon, constructed, and transformed (Shulman, 1986), it was hypothesized that the development of strategic readers may well depend upon whether teachers' explanations cause students to understand accurately the instructional content about what cognitive processing to employ when using a particular strategy. This may be particularly true of low-group students in reading who, because they tend to have relatively less knowledge of the world generally and of language and how it works particularly, are less able than high-group students to infer from generalized instructional activities that they should be strategic, when it is appropriate to be strategic, and how one reasons when being strategic. Consequently, the rationale of the study was that low reading group students would be more aware of their cognitive processing when using reading strategies and would employ such processing when using strategies if instruction were organized and presented explicitly, because explicit explanations are more likely (a) to increase students' conscious awareness of what is being taught, when to use it, and how to do it, (b) to expedite student mediation of instruction, (c) to result in accurate awareness of lesson content, and (d) to ensure that strategies are applied when reading text.

Similarities Across All Four Studies

Prior to the study reported here, 4 second-grade teachers participated in a pilot study in 1981-82, 22 fifth-grade teachers were studied in a 1982-83 classroom-based experiment, and 7 of those teachers were involved again in a 1983-84 descriptive study. A number of similarities across all the studies were found. First, each study focused on three questions: (a) Can teachers explicitly present information about how to use reading skills strategically? (b) Are such teachers more successful in increasing low-group students' awareness of lesson content than teachers who are less explicit? and (c) Are such teachers more successful in increasing low-group students' reading achievement than teachers who explain less explicitly? In all studies, explanations consisted of teacher-developed modifications of basal textbook directives, not researcher-prepared scripts for teachers to follow.

The subjects were also similar in all four studies. First, the students were all in low reading groups. Second, the teachers volunteered to participate and, in the latter three studies, all the teachers taught in various schools in a midwest urban school district where a busing policy distributed students equally among all schools in terms of socio-economic status and ethnic background. In all the studies the training for treatment teachers focused on making students consciously aware of the mental processing involved in using skills as strategies.

Third, the data collection procedures were similar in all four studies. Because ecological validity is essential to ensure that results can be applied to practice, all four studies were conducted in the natural environment of real classrooms where the teachers used mandated basal reading textbooks. Within this context researchers observed all teachers

teaching basal text-based skills to low reading groups at about one-month intervals during the academic year. Treatment teachers, however, received training designed to improve the explicitness with which they explained the mental acts associated with using skills as strategies. Control teachers received either no training or training only in the use of classroom management techniques. During classroom observations researchers monitored student engagement rates, audiotaped the lessons, and recorded field notes on the teachers' explanations and other lesson events. Immediately following each lesson, researchers interviewed several low-group students to determine their awareness of lesson content. Three awareness questions were asked: What did you learn today? When will you use it? How do you do it? Student achievement growth was determined using traditional standardized reading achievement tests; in the last two studies, these measures were supplemented by nontraditional measures.

Results of the Three Earlier Studies

The pilot study findings in 1981-82 were encouraging (Duffy, Roehler, Book, & Wesselman, 1983). In the 1982-83 classroom-based experiment, however, the results of the three research questions were mixed (Duffy, Roehler, et al., 1986). Treatment teachers were significantly more explicit in their explanations about how to use skills as strategies than control group teachers; and the treatment teachers' low-group students were significantly more aware of lesson content than their control group counterparts. There were, however, no significant differences in student achievement gains on the comprehension subtest of the Gates MacGinitie Reading Test. In short, the hypothesis that explicit explanations resulted in increased student awareness of lesson content was confirmed,

but there was no associated increase in achievement on a traditional standardized reading test.

Post hoc analysis suggested several reasons for the lack of significant differences in achievement growth. Most of these focused on the limitations inherent in using only standardized tests to assess achievement (Johnston, 1983; Paris, Cross, & Lipson, 1984; Roehler, Duffy, et al., 1986). Consequently, researchers developed several nontraditional measures of the students' use of skills as strategies. These were field tested in the 1983-84 descriptive study (Roehler, Duffy, et al., 1986). The first was a set of paper-and-pencil measures of the particular skills being taught; the second was an adaptation of the basal text's end-of-unit test; and the third was a measure of the student's strategy usage while reading Graded Oral Reading Paragraphs. In addition, the achievement test used by the host school district was used as the standardized achievement measure to limit the testing burden on students. These changes were subsequently incorporated into the present study. The results from that fourth study constitute the focus of this report.

Distinctive Features of This Line of Research

Although this line of research shares much with studies in the direct instruction tradition as well as with recent research in comprehension instruction, it is distinct from both because it focuses on informing students of the mental acts involved in strategic reading. Neither the research on direct instruction nor the research on comprehension instruction emphasizes this. Instead, direct instruction emphasizes the employment of specific teacher behaviors to increase student time on task or student attending behavior. As illustrated by recommendations from

exemplary direct instruction work such as the First-Grade Reading Study (Anderson, Evertson, & Brophy, 1979) and Madeline Hunter's program (Hunter, 1976), as well as the recommendations of reviewers (Gersten & Carnine, 1986; Rosenshine, 1986), little emphasis is placed on explicit teacher statements about the mental acts involved in doing the task.

Similarly, recent comprehension instruction research emphasizes activities which encourage, but do not explicitly explain, those mental acts. For instance, Au (1979) and Gallimore and Tharp (1983) of the Kamehameha Project recommend question asking that helps students associate their background experience with story content, but the researchers do not explain to students how to make such associations. Also, Hansen and Pearson (1983) use a weaving analogy to illustrate that inferencing is a process of integrating old knowledge with new knowledge, but they do not have teachers explain to students the reasoning involved in integrating knowledge. Similarly, Paris and his colleagues (Paris, Cross, & Lipson, 1984) and Palincsar and hers (Palincsar, in press; Palincsar & Brown, 1984; 1986), while clearly intending to develop mental processes involved in being strategic, provide no concrete examples or descriptions of what teachers say to students about the mental acts engaged in by strategic readers.

Like earlier process-product researchers such as Good and Grouws (1979) and Anderson, Evertson, and Brophy (1979), Paris and Palinscar and their colleagues note the importance of explanation but provide no descriptions of teachers' explanations of mental processing. For instance, the instructional dialogues cited by Palincsar (in press) focus on getting students to use the strategy, not on explaining to students the

thinking process one employs while doing the strategy. In sum, both the direct instruction research and the comprehension instruction research leaves students to infer what thinking processes they should engage in while performing the tasks. In the line of research reported here, in contrast, the focus is on making the underlying mental acts explicit for low-group students so that they need not infer them, thereby empowering them to perform the strategy on their own.

This line of research is also distinctive methodologically, particularly when compared to the studies in comprehension instruction. In most of those studies, the content taught to students is an adjunct curriculum that is provided for a one- or two-month period (usually by a researcher or, occasionally, by teachers who follow very directive scripts provided by the researchers). The studies reported here, in contrast, use the school districts' adopted reading materials for an entire academic year, with the regular classroom teachers making individual lesson plans for teaching the curricular outcome. This is both a strength and a weakness. The ecological validity of the study is high; however, the natural classroom environment leaves some variables uncontrolled.

The Problem

The study reported here was the fourth in the series and was conducted during the 1984-85 academic year. Similar to earlier studies, it was designed to determine whether classroom teachers of low-group students who provide explicit explanations of how to reason when using reading skills strategically would be more effective in producing student awareness both of lesson content and of the general need to be strategic and in increasing reading achievement on both traditional and nontraditional measures.

In addition, we conducted an exploratory investigation to determine whether explicit teacher explanations would improve student perceptions of themselves as readers. We posed four research questions:

1. Can teachers learn to be more explicit in explaining how to use basal text skills as strategies?
2. Are explicit teacher explanations associated with low-group students' awareness of both lesson content and the need to be strategic?
3. Are explicit teacher explanations associated with low-group students' more conscious use of skills as strategies and, ultimately, with greater reading achievement?
4. Are explicit teacher explanations associated with improved low-group student perceptions of themselves as readers?

Method

The method section includes six major subsections: the subjects, the curricular emphasis, the interventions with teachers, the measures, the general procedures, and the ways in which student engagement rates were documented.

Subjects

The subjects of the study were (a) 19 third-grade teachers employed by an urban school district in the Midwest and 1 third-grade teacher employed by a neighboring suburban school district, each of whom was randomly assigned to treatment and treated control groups and (b) the students in these 20 teachers' low reading groups. Table 1 shows the number of students in the low reading groups in the 20 classrooms. Group size varied from a low of 3 to a high of 16, with the average group size being 7.4.

All teachers met two criteria. First, they volunteered in response to a general invitation extended to all third-grade teachers in the urban

Table 1

Number of Low-Group Students in Each Classroom

TREATMENT			TREATED CONTROL		
Teacher	# of Students	Basal Texts Used[a]	Teacher	# of Students	Basal Texts Used
31	8	Skylights, Towers, part of Spinners	42	4	Skylights, part of Towers
32	4	Towers, part of Spinners	43	16	Towers, part of Spinners
33	4	Skylights, Towers	44	5	Skylights, part of Towers
34	6	Skylights, Towers	45	11	Skylights, Towers, part of Spinners
35	12	Towers, Spinners	46	6	Skylights, Towers
37	3	Towers, Spinners	47	14	Towers, Spinners
38	8	Skylights, part of Towers	48	6	Skylights, Towers
39	5	Skylights	49	7	Towers, Spinners
40	9	Towers, Spinners	50	5	Skylights, Towers
41	12	Towers, part of Spinners	51	3	Skylights, Towers

Overall Average 7.4

[a]Durr, W.K., LePere, J.M., Pikulski, J.J. (1983). Skylights. Boston: Houghton Mifflin.
Durr, W.K., LePere, J.M., Pikulski, J.J., & Brown, R.H. (1983). Spinners. Boston: Houghton Mifflin.
Durr, W.K., LePere, J.M., Pikulski, J.J., & Brown, R.H. (1983). Towers. Boston: Houghton Mifflin.

district during the previous spring and summer. Second, they were scheduled by the district to initiate instruction with one reading group in either the Skylights (Durr, LePere, & Pikulski, 1983) texts or Towers (Durr, LePere, Pikulski, & Brown, 1983b) text (second-grade difficulty) of the Houghton Mifflin basal reading series. The latter criterion served to ensure that the low groups in all the classrooms were reading at approximately the same level when the study started in September. The basal texts the teachers used with their low groups throughout the academic year are included in Table 1.

Originally, all 20 volunteer teachers were from the urban school district, with a neighboring suburban teacher serving as an alternate. When one of the urban teachers in the treatment group became seriously ill in mid-September, she was replaced by the suburban teacher. The 20 treatment and treated control subjects received modest renumeration for participating.

The Curricular Emphasis

The instructional focus was on reading skills and, more specifically, on the mental processing expert readers presumably employ when using skills as strategies. Consequently, the content of instruction did not focus on skills in the traditional sense of rules and procedures to be memorized, but rather on the reasoning one employs when using skills strategically.

As described in the next section, treatment teachers were shown how to make two kinds of decisions. First, because the basal textbook prescribed isolated skills to be taught as topics or memorized procedures, teachers were taught to make a set of decisions about how to recast the prescribed skills as problem-solving strategies. Second, because the

basal textbook's suggestions about what teachers should say when teaching the skill tended to emphasize skills as automatized procedures, the teachers were taught to make decisions about what to say about the mental processing one employs when using skills as problem-solving strategies.

To illustrate, assume the basal textbook prescribed the teaching of compound words as a reading skill and that the task emphasis in the basal text was on drawing a line between the two words making up the compound and then saying the word. The treatment teachers in this study were taught to recast that task as a problem-solving strategy by (a) establishing an actual reading situation in which an unknown compound word would be encountered, (b) teaching students to stop reading when they recognize that an unknown word poses a problem, (c) showing them how to search their repetoire of strategies for a strategy useful in solving the problem of identifying the unknown word, and (d) showing them how to reason when using the strategy to figure out the unknown compound word. The latter two steps (searching and reasoning) were the essence of the mental processing students were taught to use. For instance, for compound words teachers' explanations would include frequent references to (a) what the nature of the meaning-getting problem was in that situation and the kinds of skills that might be used to remove the blockage and (b) statements about how to look for word parts, how to recognize them as words, how to combine the meaning of the two words, and how to check to see if the combined meaning makes sense in the text.

The teachers were not provided with a script for teaching the skills this way. Instead, each teacher developed his/her own explanations about the mental processing associated with the skill being taught based on the above principles. Because individuals all process information in unique

ways, teachers were taught to present their explanations of cognitive processing as descriptive of what good readers do, rather than as prescriptions, and were taught to encourage students to make appropriate individual modifications.

The Interventions With Teachers

Interventions were provided for both the treatment and the treated control teachers. Both groups attended separate orientation meetings held during the first week of school in August. At these meetings, the teachers in each group were introduced to the project and provided with an overview of their respective treatments. Neither group knew about the existence of the other, and both believed they were the only experimental group. All subsequent sessions with teachers occurred after baseline data were collected.

The intervention for the treated control group consisted of two 2-hour group sessions during the fall which focused on the use of management principles from the First-Grade Reading Group Study (Anderson, Evertson, & Brophy, 1979). The group was told that the purpose of the study was to validate the original findings at the third-grade level. The intervention training followed precisely that employed by the original researchers. Additionally, a maintenance session (not provided in the original study) was held in January to allow teachers to review the management principles and to discuss their implementation of these principles. The treated control teachers also received additional informal coaching from researchers following observations. The management principles are listed in Appendix A.

The intervention for the treatment group consisted of six 2-hour training sessions, one each in the months of September, October, November, January, February, and April. The information presented in these sessions emphasized (a) how to present prescribed basal text skills as strategies as described above; (b) how to make explicit statements about the strategy being taught, when it would be used, and how to do the mental processing involved in using it strategically; and (c) how to organize these statements into a lesson format that progressed from an introduction, to modeling, to interaction between teacher and students, to closure. Many of the staff development techniques developed in earlier studies were used, including procedures for one-on-one coaching, collaborative sharing among the teachers, providing specific feedback regarding observed lessons, and the use of videotapes. For greater detail on the staff development model undergirding the intervention with treatment teachers, see Putnam, Roehler, and Duffy (1987).

In addition to the above training, teachers in the treatment group also received the same report of the First-Grade Reading Group Study (Anderson, Evertson, & Brophy, 1979) that the treated control teachers used and, like the treated control teachers, they were urged to incorporate the management principles into their reading instruction. Researchers monitored the treatment teachers' use of these principles during the academic year just as they did with the treated control teachers.

While the two interventions were distinctive in terms of their respective content emphasis, both the treatment and the treated control teachers received identical instruction from researchers in some areas. In addition to the management principles noted above, both groups of teachers received identical information on (a) how to implement

Uninterrupted Sustained Silent Reading as part of a classroom reading program, (b) the effects of such a program, and (c) the benefits of employing it. This was done to increase the likelihood that skill instruction in both treatment and treated control classrooms would occur in a context that encouraged genuine literacy events, such as self-selected reading for enjoyment. Similarly, to increase the likelihood of equal test-taking skills by students in both groups during the posttest administration of the achievement test, in March of the year of the study both the treatment teachers and the treated control teachers received identical printed suggestions about how to prepare students to take a standardized reading test, discussed the implementation of these with researchers, and agreed to present them to their students.

Measures

This four-part section describes each type of measure used in the study: a measure of the explicitness of the teachers' explanations, measures of student awareness, measures of student achievement, and measures of student self-perceptions.

The Measure of Teacher Explanation

To measure the explicitness of the explanations of treatment and treated control teachers, a rating instrument was used to rate audiotaped transcripts of teachers' lessons. This instrument, similar in many ways to the instrument used in previous studies (Duffy, Roehler, et al., 1986), was modified for this study to reflect recent findings from the earlier studies regarding specific characteristics of teacher explanation (Rackliffe, 1986). The modified instrument was organized into three parts to reflect three aspects of explanation: the information presented, the

means used to present it, and cohesion. Each part included subcategories, with a total of 11 subcategories rated. A copy of the rating instrument is provided in Appendix B.

Part I of the rating instrument, the information presented, focused on what teachers told students about (a) the task to be learned, (b) the usefulness of the task, (c) the selection of the strategy to be used, and (d) how to perform the strategy. Part II, the means used to present information, focused on the teacher's (a) introduction to the lesson, (b) modeling, (c) diminishing assistance during interaction, (d) eliciting of student responses, and (e) closure. Part III, cohesion, focused on the cohesion within the lesson and cohesion with past and future lessons. Each of the 11 subcategories was rated on an explicitness scale of 0 to 4 (with 0 being the absence of the criterion and 4 being an exemplary presence of the criterion). The maximum obtainable explanation score was 44 points.

The typed transcripts of teachers' lessons were rated by raters trained to use the explanation rating form. Raters were graduate students majoring in teacher education at Michigan State University. Six raters were paired into three teams of two raters each. The training of raters consisted of a series of five 1- to 2-hour sessions conducted by researchers. Lesson transcripts selected from those collected during the 1982-83 and 1983-84 studies were used for training.

As part of this training, researchers gave raters general information about the structure and goals of the study and their role as raters. Then researchers used a videotaped lesson and sample lesson transcripts to model how to rate lesson transcripts. Researchers then gave raters successive opportunities to practice rating additional sample transcripts.

All raters rated identical transcripts during training to ensure inter-rater reliability across all six raters. As part of the training, raters developed conventions to guide their rating. When the rating teams achieved an inter-rater reliability of .80, the actual rating of lesson transcripts from this study began. Researchers periodically met with raters during the academic year and provided feedback and conducted discussions to clarify any ambiguities that may have arisen.

Lesson transcripts were rated in a series of "rating rounds." For each round, each rating team received a packet of 10-15 transcripts to rate. Twenty-five percent of all the transcripts in each packet were rated by all three rating teams to monitor inter-rater reliability. On-going inter-rater reliability both within pairs and across pairs was computed on these commonly rated transcripts following each rating round. To maintain the .80 criterion for acceptable inter-rater reliability, researchers provided supplemental training for raters as needed. The average reliability for the rating teams across the academic year was .81.

Raters used the following procedures when rating lesson transcripts. First, each rater independently read and rated all transcripts in the packet. These ratings were recorded on an individual summary sheet. Second, each rater conferred with his/her rating partner, compared assigned ratings for each rated category of explanation and reconciled any differences in scores to arrive at a single team score for each lesson. Third, each team submitted its jointly determined scores as final ratings.

The Two Measures of Student Awareness

Student awareness was measured in two ways. Awareness of lesson content was determined using postlesson interviews (hereinafter called the "lesson interviews"). Awareness of the need to be strategic when reading

was evaluated using an interview given at mid-year and at the end of the year (hereinafter called the "concept interviews").

The lesson interviews. The lesson interviews were used to determine whether students were consciously aware of what the teacher was teaching during individual lessons. To determine whether low-group students possessed such awareness of lesson content, researchers interviewed five students in each of the treatment and treated control classrooms immediately following each observed reading lesson regarding their declarative knowledge (what they were learning), their situational knowledge (when they should use it), and their procedural knowledge (how they should use it) as in Paris, Lipson, and Wixson, 1983. Three of the students were target students who were selected at random before the first observation and interviewed after every observed lesson; the other two students were randomly selected for each interview from the balance of students in the low group. If a target student was absent or moved away during the study, another student from the low group was randomly selected to complete the complement of five interviewees. Six interviewers (faculty members and advanced graduate students), each of whom was responsible for both lesson observation and interviews in designated classrooms, were trained to conduct the interviews in that classroom and to probe responses without leading students.

Three levels of questions were posed. At the first level, the student was simply asked to tell all that could be remembered about the lesson. The second level consisted of three questions: (a) What were you learning in the lesson I just saw? (b) When would you use what the teacher was teaching you? and (c) How do you do what you were taught to do? The third level was a repetition of the second level but the questions were

asked using examples of the lesson content (e.g., worksheets or text examples used by the teacher in the actual lesson). The basic questions were supplemented by a list of additional probes that interviewers could use if needed. The "how" question was asked of all students at the three levels. On the basis of student answers at prior levels, interviewers decided whether to ask the "what" and "when" questions again.

The data consisted of typed transcripts of audiotape recordings of the student interviews. Students' responses were rated using an instrument developed and used in previous studies (Duffy, Roehler, et al., 1986). It consisted of categories for rating the students' verbal statements about (a) what strategy was taught (declarative knowledge), (b) the context or situation in which the strategy should be used or applied (situational knowledge), and (c) how one employs the strategy (procedural knowledge). Each criterion received a rating of 0 to 4 depending on the depth and completeness of the student's response, with a score of 0 being an absence of awareness and a score of 4 being exemplary awareness. Scores for the three categories were summed. The highest possible score was 12. A copy of the rating criteria is included in Appendix C.

Transcripts of student interviews, like the transcripts of teacher's lessons, were rated in rounds by raters trained in the use of the rating instrument. Two 2-member teams rated student interviews. The selection of raters, their training, the ongoing procedures for maintaining reliability, and the computation of inter-rater reliability were the same as that used for the rating of teacher explanation. The average reliability for the student awareness rating teams across the academic year was .84.

To rate the interviews, the following procedures were used. First, raters identified where in the transcript the Level 1 question began and ended. This response was then rated for each of three specific categories (a) declarative knowledge, (b) situational knowledge, and (c) procedural knowledge. This same procedure was used for Level 2 and Level 3 responses. If a question was not asked at Level 2 because the interviewer believed the information had been provided by the student at the first level, the category was given the same score as was assigned for Level 1. For example, if a response of four was given for declarative knowledge at Level 1 and this question was not asked at Level 2, the student received a rating of four at the second level. There are three benefits of using this scoring system. To illustrate, assume that Student A responded in the following manner:

Level 1: What = 4, Why = 2, How = 1

Level 2: What = N/A, Why = 3, How = 1

Level 3: What = N/A, Why = 4, How = 3

Overall Total = 11 (sum of the highest rating in each category across levels).

First, this scoring system offered the student ample opportunity to respond to interview questions. Second, redundancy in question asking in Level 2 and 3 were eliminated, thus reducing the possibility that a repeated question might signal to the student that the previous response was not appropriate. Third, it allowed for a more in-depth, post hoc examination of the extent to which the student was aware of lesson content. In the above example, for instance, Student A gave an in-depth description of what the lesson was about at Level 1. However, the student's description

of how to use what was taught resulted only after focusing the student on the materials used during the lesson (Level 3).

The concept interviews. The second measure of student awareness, the concept interview, was used to determine if explicitness about strategic use of skills resulted in global student conceptual understandings about reading. To assess this outcome, the three target students randomly selected from each teacher's low reading group at the beginning of the study were asked the questions on the concept interview on two occasions, one at the midpoint of the academic year and one at the end of the year. There was no baseline measure because the interview format had not yet been developed when baseline data were collected early in the school year.

During the concept interviews researchers asked four general questions about the student's concept of reading and what one does when encountering a situation where text comprehension is disrupted: (a) What do good readers do? (b) What is the first thing you do when you are given a story to read? (c) What do you do when you come to a word that you do not know? (d) What do you do when you come upon a sentence or story you do not understand? Analysis of responses to these questions provided insight into students' conceptual understandings about reading, particuly the need to be strategic and their ability to control meaning getting through the application of strategies.

The Six Measures of Student Achievement

Student achievement was measured in six ways. The two traditional standardized measures used were the Stanford Achievement Test (SAT) and the Michigan Educational Assessment Program (MEAP). Nontraditional measures included a paper-and-pencil skills test (hereinafter called the Supplemental Achievement Measure or SAM), an Error Detection Test (EDT),

and a modified Graded Oral Reading Paragraph (GORP). Additionally, students' scores on the unit skills tests given by teachers as part of the mandated basal reading program were noted (Magazine Test).

The Stanford Achievement Test. The first traditional measure of student achievement was the reading portion of the Stanford Achievement Test. The SAT was mandated for use in the host school district and included two subtests, word study and comprehension. The school district administers the test to all students in late spring of each academic year. For the purposes of this study, the scores received by each third-grade low-group student in the treatment group and treated control group in April of the second-grade year served as the pretest; the scores each of these students received in April of the third-grade year served as the posttest.

The Michigan Educational Assessment Program. The second traditional measure of student achievement was the Michigan Educational Assessment Program. It is administered in October of each academic year to all fourth- seventh- and tenth-grade students in Michigan. Since students in this study were third graders, this test was used when they became fourth graders to determine what achievement differences might exist among participating low-group students in October of the academic year following the end of the study. This test measures both reading and math, but only reading scores were used for this study. The reading section of the MEAP consists of 75 items that measure student performance in vocabulary, literal comprehension, inferential comprehension, critical reading, and study skills.

The Supplemental Achievement Measure. The first nontraditional measure was the Supplemental Achievement Measure. It was written and designed by the researchers to determine (a) whether students could perform

the specific skill tasks for which they received instruction, and (b) whether they were consciously aware of their reasoning when they used the skill. It was expected that explicit explanations of the mental processing involved in using skills as strategies would cause treatment students to perform particularly well on the second part of the test.

Part I tested student ability to do the skill task. For instance, when the basal textbook prescribed a skill labeled "multi-meaning words," students were given the following task after instruction was completed:

> Researcher reads directions orally: Read the following sentence to yourself. Pay attention to the underlined word. Look up when you are finished.
>
> Tom went to the park to <u>fly</u> his kite.
>
> [Student reads sentence]
>
> Researcher reads directions orally: Now read the next two sentences to yourselves. Put an X before the sentence where the underlined word means the same as in the numbered sentence.
>
> 1. The batter hit a <u>fly</u> ball to the pitcher.
>
> 2. Jim likes to <u>fly</u> airplanes for a hobby.
>
> [Student marks the answer]

Part II assessed students' awareness of their reasoning about how to use the skill. For instance, the second part of the Supplemental Achievement Measure on multi-meaning words was as follows:

> Researcher reads directions orally: I am going to read a question and some possible answers. Choose the best answer. Put an X before your answer.
>
> How did you choose the sentence where "fly" meant the same as it did in the first sentence?
>
> ____ I looked at the words around the word "fly." They helped me figure out the meaning of the word.
>
> ____ I read the sentences to see if they had question marks or periods and that helped me decide.

____ I thought about what should happen next. That helped me find the word that made sense.

[Student marks answer]

The skills tested with the SAM test were the same skills tested by the basal program's Magazine Tests, which are the criterion-based tests that accompany the Houghton Mifflin basal series used by all teachers in the study. Fifteen different skills were tested in association with the Skylights basal text (Durr, LePere, & Pikulski, 1983), 10 skills tested in association with the Towers text (Durr, LePere, Pikulski, & Brown, 1983b) and 15 in association with Spinners (Durr, LePere, Pikulski, Brown, 1983a), the first third-grade book in the Houghton Mifflin series, which some low group students were using by the end of the academic year. The complete list of skill tests created is provided in Appendix D.

The researchers assigned to observe in particular classrooms administered the SAM tests for the skills prescribed in the basal unit(s) most recently taught by the teacher. Testing was done three times during the year. The skills to be tested during any one test administration depended on which basal text the group started with in September and on what skills the teacher had taught since the previous administration of the SAMs. The number of skill tests administered to any one group of students ranged from a low of 3 to a high of 18, with the average being 7. The average number of SAM tests taken per student across the year was 21. The average administration time for each testing session was 20 minutes. All three low-group target students took the test together in a location outside the classroom. The researcher read verbatim the directions for the test administration, as noted in the examples above.

The Error Detection Test. The Error Detection Test (EDT) was adapted from an earlier study reported by Paris, Cross, and Lipson (1984). It

consisted of a paragraph in which semantic and syntactic errors were embedded. Students were directed to underline the places in the paragraph that did not make sense. A copy of the paragraph appears in Appendix E. The same paragraph was administered in September and again in May to the low-group students in each treatment and treated control classroom.

The Modified Graded Oral Reading Paragraph. The third nontraditional achievement measure was a modification of the Graded Oral Reading Paragraph test used by reading specialists when diagnosing student needs. The GORP was designed to determine whether students actually used strategies when reading text. Specifically, the GORP was designed to determine, through self-report data, student use of word recognition and word meaning strategies when encountering previously designated embedded words and when spontaneously self-correcting. The three randomly chosen target children selected before the study began were tested on a passage in September and again in May. The third-grade passage from Houghton Mifflin's Placement Test was selected because (a) the Houghton Mifflin program was used in all elementary grades in the host school district, (b) none of the students in the study had previously read the passage, and (c) the content of the paragraph offered opportunities to observe student response to semantic cueing (Wixson & Lipson, 1986) and student self-corrections of spontaneous errors (Clay, 1972). Project researchers, based on their previous experience as reading specialists, judged this paragraph to be of sufficient difficulty to elicit self-corrections but not too difficult to cause extreme frustration for third-grade low-group readers. A copy of the passage is included in Appendix F.

Three researchers were trained as testers. For both the pretest and the posttest they administered the 30-minute test individually to each

target student in a room other than the classroom. Each student's performance was tape recorded for subsequent analysis.

Each testing session proceeded as follows. A preliminary test of sight word recognition involving 30 words (provided by Houghton Mifflin as part of the test) preceded the actual reading of the GORP and served as a warm-up activity. Then the student was shown the first of two predetermined target words embedded in the text ("grub"). The student was asked to pronounce the word and use it in an original sentence. It was anticipated that the meaning as used in the paragraph (a type of insect) would be initially unknown to most of these low-group third graders. If the word was mispronounced by the student, the correct pronunciation was provided by the researcher. The second embedded target word ("uncovered") was pointed out to the students following the reading to determine their use of prefixes as a strategy.

The student was then given a copy of the selection and was asked to read it aloud and to remember what was read so that it could be retold after the reading. Students were reassured that they might not read the entire story, but that they should read as far as possible. It was important that all students at least read past the point at which the target words "grub" and "uncovered" were introduced into the narrative. The decision to stop the reading at a point beyond these words was based on tester discretion given the perceived level of difficulty for the student. As the student read, the researcher recorded instances of self-corrections and hesitations. At the end of the reading, the student's copy was removed and s/he was asked to retell all that could be remembered about what had just been read.

Student self-report information about the use of strategies while reading the passage was elicited after the retelling. The tester selected examples of self-corrections noted during the oral reading of the selection and asked the student why s/he made a particular self-correction and how the self-correction was accomplished. Each student's verbatim responses were audiotaped, and there were 2 to 5 examples of self-corrections for each student. The tester then asked students about the embedded words.

First, students were asked whether they now knew the meaning of "grub" and, if so, how this meaning was determined (since it was unknown before reading the passage). Then the student was asked to explain how to figure out the word "uncovered." This ended the testing session for each student. The primary intent was to assess students' use of strategies by examining their self-reports of (a) their self-corrections and (b) their responses to the two embedded words.

Magazine Tests. The students' scores on the above-mentioned Magazine Tests were also recorded. As noted above, these were the end-of-unit tests associated with the Houghton Mifflin basal text program that the teachers administered and recorded as part of their regular routine. These data were then collected for use in this study because the students in both the treatment and treated control groups were using basals from similar levels in the same series and were, therefore, taking the same unit tests. A sample Magazine Test is included in Appendix G.

The Two Measures of Student Self-Perception

Two self-perception measures were designed to assess students' perceptions about their reading achievement and about the amount of reading they did. Researchers administered each measure individually in

September and again in May to the same three randomly selected target students from each treatment and treated control classroom.

Perceived place in the reading group. The first self-perception measure was a pre/posttest measure of students' perceptions of their place in the reading group, adapted from a measure used by Weinstein (1980). The interviewer presented each student with a scale designed as a ladder, which students were told represented the reading group. The persons on the top rungs represented high reading group achievers and the persons on the bottom rungs represented low reading group achievers. The student was instructed to place him- or herself on the rung of the ladder which represented his or her perceived place in the reading group.

Perceived amount of reading. Researchers also administered the second measure individually on a pretest/posttest basis to the randomly selected target students. Each student was shown two pictures, one of a house and three different-sized piles of books and another of a school and three different-sized piles of books. The interviewer directed each student to draw a line first from the house to the pile of books that best represented the amount of reading done at home and then from the school to the pile of books which represented the amount of reading done at school. The measure is provided in Appendix H.

Summary of the Measures Used

To determine whether explicit teacher explanations about reading skills increased student awareness, student achievement, and student self-perceptions, 11 measures were used: 1 of the teachers' explanations, 2 of the students' awareness, 6 of the students' achievement, and 2 of the students' self-perceptions.

Procedures

The study, designed as a naturalistic experiment, involved two sets of classrooms: a treatment group and a treated control group. The treatment teachers attended the orientation session and six 2-hour training sessions as described in the above section on "The Interventions with Teachers." Their reading skill lessons were observed 11 times during the academic year. The treated control teachers attended an orientation session and three training sessions as described in the same section above. The treated control teachers were observed 6 times during the academic year.

Researchers used six observations, designated in advance, for primary data-collection purposes; and during these observations they collected data regarding teacher explanation and student awareness of lesson content for both the treatment group and the treated-control group teachers. In these lessons teachers taught whatever reading skill was planned for that day as part of the routine basal text instruction. During each observation the researcher audiotaped the lesson, recorded supplementary field notes, completed forms regarding the teacher's use of explanation, noted student engagement on tasks, recorded breaks in the activity flow, and noted teachers' use of the management principles associated with the Anderson, Evertson, and Brophy (1979) study. Immediately following the observed lesson, the researcher individually took five low-group students to a nearby room or to the hallway outside the classroom to interview them about the lesson. These data collection procedures were identical for both the treatment and the treated control groups, as described in the preceding section on "Measures."

Five additional observations, which alternated with the six designated data-collection observations, were scheduled for treatment teachers. During these supplementary observations, researchers monitored treatment teachers' progress in implementing explanation techniques, provided them with additional coaching on how to implement the training, and audiotaped the lesson being taught to the low group for use in later training sessions with the teachers. No lesson interviews were conducted during these supplementary observations, and the teacher data were not used to answer the research questions.

Documenting Student Task Engagement

While it can be assumed that the random assignment of subjects resulted in comparable student task engagement for both the treatment and treated control classrooms, data were collected to document that any differences in student outcomes were not attributable to factors associated with time-on-task. Data included each teacher's management skills, the attendance of the low-group student subjects, and the basal text content coverage of each low group. The results of these data collection efforts are presented here to establish that there were virtually no differences in student time-on-task and, therefore, task engagement variables probably had little or no impact on the findings regarding the research questions reported in the section that follows.

Differences in Teacher Management

Effective teacher management is associated with high student engagement rates. To document differences in teacher management ability, specific observer training and data collection procedures were employed, and data were recorded during each observation of both treatment and treated

control group teachers. First, observers were trained to recognize and record instances in which the management principles identified by Anderson, Evertson, and Brophy (1979) were used. Each teacher's rating on each observation ranged from a low management rating of 0 to a high of 100 with the rating representing the percentage of the number of management principles used during the lesson. Second, research staff members were trained to identify and count instances of management problems such as transitions, breaks to attend to materials, shifts from lesson goals to something else, off-task pupil behavior, and interruptions that were beyond teacher control. These were termed subjective management ratings. Observers assigned a rating of 1 to 3 for each observed lesson with 1 being equal to a low number of management problems and a rating of 3 being equal to a high number of management problems.

Multivariate analysis of covariance (MANCOVA) was conducted for Observations 2 through 6 for both the management principles and the observer ratings. Ratings from Observation 1, which was the baseline observation, served as the covariate. The results indicate that there were no significant management differences betweeen groups (e.g., Observation 6--$F(10,1) = 1.319$, $p = .590$). The means and standard deviations for this set of data are displayed in Table 2. Similar results were obtained from a one-way repeated measures multivariate analysis of variance (MANOVA), again using the management principles ratings and observer ratings as dependent measures across all six observations ($F(1,12) = .484$, $p = .450$). These findings indicate that the observers rated both the treatment and the treated control teachers equally on management ability throughout the year. Consequently, differences in student outcomes cannot be attributed to differences in teachers' management skills.

Table 2

Means and Standard Deviations For
Management Principles and Observer Ratings

Category	Group	Observation 1 Mean (SD)	Observation 2 Mean (SD)	Observation 3 Mean (SD)	Observation 4 Mean (SD)	Observation 5 Mean (SD)	Observation 6 Mean (SD)
Management principles	Treatment	51.80 (19.46)	68.70 (20.80)	68.00 (29.79)	81.20 (19.15)	76.80 (23.81)	77.00 (21.93)
	Treated Control	51.88 (19.58)	68.40 (24.13)	76.70 (21.38)	82.90 (18.45)	85.40 (19.37)	87.90 (17.89)
Subjective management ratings	Treatment	1.75 (0.59)	1.00 (0.51)	1.83 (0.66)	1.50 (0.71)	1.55 (0.64)	1.50 (0.53)
	Treated Control	1.75 (0.60)	1.85 (0.41)	1.60 (0.39)	1.55 (0.43)	1.50 (0.58)	1.67 (0.61)

Differences in Attendance

Regarding attendance, there were no significant differences in the average attendance of low-group students in the treatment or treated control groups. The mean number of days absent per low-group student in the treatment group was 7.86 and for the treated control group, 8.11. This suggests that differences in student awareness and achievement cannot be attributed to differences in the amount of time the students spent in school.

Differences in Content Coverage

Content coverage was determined by noting how many basal text units were completed during the year by the low reading groups in each of the participating classrooms. The number of units completed by the low reading groups in treatment classrooms ranged from 3 to 6 with a mean of 5.25, whereas the number of units completed by the low reading groups in the treated control classrooms ranged from 3 to 8 with a mean of 5.50. This suggests that differences in student outcomes cannot be attributed to differences in content coverage.

Summary of Task Engagement

The above data indicate that the treatment and treated control classrooms were not significantly different in teacher management skills, allocated time, or student engagement. Consequently, results cannot be attributed to task engagement factors.

Results And Discussion

The results for the four research questions are presented in this section. Correlational data are presented at the end of the section.

Question 1: Can Teachers Learn to Be Explicit?

Individual analyses of covariance were performed to examine differences between teachers' explanations at Observations 2 through 6 (teachers' explanation ratings on Observation 1 were used as the covariate). There were no significant differences in the explanation ratings of treatment and treated control teachers on the baseline observation ($F(1,18) = 3.578$, $p = .061$). Explanation ratings of treatment teachers were significantly higher than explanation ratings of treated control teachers beginning with Observation 3 ($F(1,17) = 24.639$, $p < .001$) and continuing through 6 ($F(1,17) = 6.118$, $p = .024$). Means and standard deviations are displayed in Table 3.

To identify the treatment effects across the academic year, a repeated measures analysis of variance using all six observations as time points was performed. Results indicated a significant main effect favoring the explicitness of treatment teachers' explanations ($F(1,18) = 9.267$, $p > .001$). Roy-Bargeman Step-Down F-tests revealed a significant treatment x time increase for treatment teachers between Observation 1 and 2 ($F(1,18) = 4.472$, $p = .048$). This suggests that, even though the differences between treatment teachers' explanation ratings and treated control teachers' explanation ratings was large throughout the year, the greatest increase in ratings for treatment teachers occurred between the first two observations.

The results of these analyses also indicate that treatment group variances, as reflected in the standard deviations in Table 3, are somewhat larger than the treated control group variances for Observation 1. However, because subjects were randomly assigned and because variances between groups were statistically nonsignificant, they pose little threat

Table 3

Means and Standard Deviations for
Teacher Explanation

Group	Observation 1 Mean (SD)	Observation 2 Mean (SD)	Observation 3 Mean (SD)	Observation 4 Mean (SD)	Observation 5 Mean (SD)	Observation 6 Mean (SD)
Overall	11.45 (4.45)	14.30 (7.54)	15.10 (6.18)	15.80 (7.56)	13.85 (6.63)	13.40 (6.90)
Treatment	13.40 (5.60)	17.60 (8.01)	19.90 (9.00)	21.30 (6.46)	18.50 (5.66)	17.70 (6.89)
Treated Control	9.50 (1.43)	11.00 (5.62)	10.30 (2.41)	10.30 (3.43)	9.20 (3.55)	9.10 (3.44)

to internal validity. Increases in variance for the treatment group in Observations 2 through 6 can be attributed to the facility with which some teachers implemented explanation training. In addition, the slight decline in explanation ratings in both groups at the end of the year is not seen as a serious problem. Whereas the effects of training may have diminished across the school year, it is more likely, given the constraints on teachers' time at the end of the school year, that teachers had less time available to plan and to conduct lessons later in the year than earlier in the year.

In sum, the results substantiate that teachers can become more explicit in explaining reading skills as strategies. This result is consistent with the results of previous studies (Duffy, Roehler, Meloth, & Vavrus, 1986).

Question 2: Is Explanation Related to Student Awareness?

The second question asked whether explicit teacher explanation helps low group students to be more aware both of lesson content and of the strategic nature of reading generally. Two measures were employed, one for awareness of lesson content and one for awareness of the need to be strategic when reading. All student awareness data were aggregated by classroom.

Awareness of Lesson Content

To investigate the differences in awareness of lesson content between students in treatment and treated control classrooms, multivariate analysis of variance, multivariate analysis of covariance, and repeated measures analysis of variance procedures were used. For the MANCOVA, ratings of responses for the three awareness categories (what was the lesson about

or declarative knowledge, why is it useful or situational knowledge, how do you apply what you were taught or procedural knowledge) were the dependent measures. Ratings for each of the above three categories for Observation 1 (the baseline observation) was the covariate for the MANCOVA. Table 4 gives the means and standard deviations for awareness at each observation.

Multivariate analyses of variance indicated no differences in awareness of lesson content between students in treatment classrooms and students in treated control classrooms for the baseline (Observation 1) ($F(3,16) = 0.538$, $p = .663$). Even though there were no initial differences between groups on baseline awareness ratings, MANCOVAs were performed to increase the power of the F-test. As shown in Table 5 this multivariate analysis revealed that students in treatment classrooms were rated higher in their overall awareness of lesson content for the sixth (or final) observation ($F(3,13) = 5.66$, $p = .01$). Univariate analyses indicated that this difference at the final observation was due to significantly higher ratings on two of the three categories: situational knowledge ($F(1,15) = 18.29$, $p < .001$) and procedural knowledge ($F(1,15) = 8.71$, $p < .001$). No differences were found between groups for declarative knowledge ($F(1,15) = 2.99$, $p = .104$).

Additional MANCOVAs revealed that the above differences between students' awareness of lesson content in treatment and treated control classrooms first appeared at the fourth observation ($F(3,13) = 3.449$, $p = .0485$). At the fourth observation, the situational knowledge and procedural knowledge categories were found to contribute to the main effect ($F(1,15) = 9.316$, $p = .0080$ and $F(1,15) = 9.728$, $p = .007$, respectively). No differences were found at any time between groups on declarative knowledge.

Table 4

Means and Standard Deviations for
Lesson Interview Ratings for Observations 1 through 6

Group & Awareness	Observation 1 Mean (SD)	Observation 2 Mean (SD)	Observation 3 Mean (SD)	Observation 4 Mean (SD)	Observation 5 Mean (SD)	Observation 6 Mean (SD)
Overall total	3.32 (1.15)	3.29 (1.59)	4.57 (1.67)	4.47 (1.59)	4.80 (1.67)	4.45 (1.98)
Declarative	1.27 (.411)	0.97 (.631)	1.60 (.522)	1.50 (.619)	1.55 (.526)	1.25 (.588)
Situational	0.760 (.676)	1.06 (.602)	1.23 (.958)	1.17 (.778)	1.20 (.917)	1.32 (.855)
Procedural	1.26 (.670)	1.26 (.696)	1.74 (.758)	1.78 (.778)	2.03 (.752)	1.58 (.867)
Treatment total	3.58 (1.83)	3.62 (1.37)	4.86 (2.19)	5.51 (1.59)	5.53 (1.63)	5.84 (1.23)
Declarative	1.28 (.465)	1.08 (.641)	1.53 (.570)	1.58 (.410)	1.66 (.537)	1.75 (.447)
Situational	0.915 (.840)	1.12 (.635)	1.51 (1.230)	1.67 (.657)	1.59 (1.02)	1.95 (.561)
Procedural	1.36 (.819)	1.41 (.511)	1.81 (.832)	2.26 (.679)	2.31 (.850)	2.11 (.677)
Treated control total	3.02 (1.12)	2.96 (1.80)	4.28 (0.95)	3.44 (1.33)	4.04 (1.40)	3.06 (1.41)
Declarative	1.26 (.374)	0.85 (.633)	1.67 (.490)	1.42 (.795)	1.45 (.522)	1.29 (.644)
Situational	0.60 (.457)	0.998 (.593)	0.95 (.502)	0.69 (.562)	0.81 (.627)	0.68 (.583)
Procedural	1.16 (.503)	1.11 (.843)	1.66 (.712)	1.30 (.557)	1.76 (.681)	1.06 (.719)

Table 5

MANCOVA[a] For Lesson Interviews: Observation 6

Source	df	Sum of Squares Cross Products: Declarative Knowledge	Situational Knowledge	Procedural Knowledge	Multivariate F (df)	Univariate F: Declarative Knowledge	Situational Knowledge	Procedural Knowledge
Constant	1		U_1 U_1		-----	----	----	----
Between groups (eliminating covariates)	1	1.09 2.66 2.28	6.51 5.59	4.80	5.66* (3,13)	2.99	18.29**	8.71*
Covariates (eliminating design effects)	3	.08 - .13 - .13	.56 .33	.52				
Within Groups (eliminating covariates)	15	5.46 0.98 2.09	5.34 3.50	8.27				
Total	20							

[a]Lesson Interviews for Observation 1 used as covariate.

* $p < .01$

** $p < .001$

Finally, one-way repeated analyses of variance, using the six observations as time points (i.e., when interviews were conducted) were performed to examine the differences in students' awareness of lesson content across time. Results indicate that ratings for overall awareness (sum of the three levels) increased gradually throughout the year for students in treatment classrooms ($F(1,18) = 13.650$, $p = .002$). The same analyses performed on each of the three types of knowledge revealed that treatment students were significantly more aware across time than treated control students for situational knowledge ($F(1,18) = 11.070$, $p = .004$) and for procedural knowledge ($F(1,18) = 9.890$, $p = .005$), but not for declarative knowledge ($F(1,18) = 2.127$, $p = .161$). These lesson interview results indicate that low-group students who are taught by teachers who provide explicit explanations of the mental processes involved in using skills strategically became more aware across time of the situational and procedural knowledge presented during the lesson. Treatment and treated control students' awareness of declarative knowledge was equal across time.

In an exploratory analysis, the researchers also analyzed the data by levels to examine the hypothesis that explicit explanations would result in increased student awareness at Level 1--general awareness. Group differences were found in Observations 4 through 6 for the Level 2 questions ($p = .008$, .031, and .001 respectively) but not for Level 1 or Level 3. Thus, the hypothesis was not supported. Interview questions directed toward specific lesson content (Level 2) were more likely to discriminate between treatment and treated control students.

In sum, the lesson interview results indicate that students who receive explicit explanations about the use of reading skills as strategies report more awareness of lesson content following instruction than students

who receive less explicit explanations. Stated in terms of student mediation of instruction (Doyle, 1983; Winne, 1985), students who receive explicit explanations more accurately mediate instructional information presented during lessons.

Awareness of the Strategic Nature of Reading

To determine how aware students were of the strategic nature of reading generally, researchers analyzed the 60 concept interviews collected from the 20 classrooms at the end of the study using verbal report analysis procedures suggested by Ericsson and Simon (1984).

Two procedures were used. First, researchers examined and categorized students' responses to each of the four questions individually. This gave the researchers an understanding of the range of responses to each of the questions. Second, researchers discussed the interview responses across all four questions in an attempt to identify the overall concept of reading possessed by each subject. Whereas the intention of the interview ratings was not to impose any predetermined categorization scheme, as a general guideline statements were examined for evidence of strategic reading (Paris, Lipson, & Wixson, 1983). Thus, questions asked of students during the interviews were intended to assess overall knowledge of the reading process independent of specific lesson content.

Assessing concepts for evidence of strategic reading seemed important for two reasons. First, the project trained teachers to explain reading skills as a strategic process, which required flexibility on the part of the reader. Thus, it was expected that "good" responses to these questions would indicate a concept of reading as an active process of comprehending text. Second, conceptualizing reading as a strategic process represents cognitive psychology's current view of reading and comprehension

(Baker & Brown, 1984) and, therefore, "good" responses should include elements of this view.

With this as a general guideline, the researchers began the analysis by examining each of 16 randomly selected interviews for evidence of strategic reading. Through discussion, 10 categories emerged and are listed in Table 6. A seven-point Likert-type scale was used to ensure adequate differentiation in the range of responses for each of the 10 concept categories. Once the categories and scoring system were agreed upon, each researcher then examined each of the 16 transcripts individually to see if he or she could identify examples of the 10 categories. This was done to eliminate any influence of group discussion in identifying elements of reading concepts. The remaining 44 interviews were then analyzed.

MANOVA procedures were used with the 10 concept categories serving as the dependent measures. The means and standard deviations are given in Table 6. The MANOVA revealed a significant difference in the overall concept interview rating favoring students in treatment classrooms ($F(10,9) = 7.55$, $p = .0027$). As noted in Table 7, 6 of the 10 categories contributed to the difference between the two groups:

Reading is a self-directed activity: $F(1,18) = 19.330$, $p < .001$,

Reading involves problem solving: $F(1,18) = 5.145$, $p < .05$,

Skills and rules aid in comprehension: $F(1,18) = 5.626$, $p < .05$,

The purpose is to get meaning: $F(1,18) = 5.484$, $p < .05$,

Reading involves conscious processing: $F(1,18) = 5.567$, $p < .05$,

Reading involves selection of strategies: $F(1,18) = 4.12$, $p < .05$.

While low-group students' metacognitive awareness of reading in general is often characterized as poor (Canney & Winograd, 1979; Myers & Paris, 1978), these findings suggest that these more global concepts can

Table 6

Means and Standard Deviations for
Concept Interviews

Concepts	Treatment		Treated Control	
	Mean	(SD)	Mean	(SD)
Total	3.11	(1.01)	2.21	(0.56)
Involves intentionality	2.53	(1.04)	1.78	(0.85)
Involves effort	3.33	(1.65)	3.12	(1.37)
Is systematic	2.96	(1.70)	1.78	(1.13)
Is self-directed	4.43	(0.89)	2.68	(0.89)
Involves problem solving	3.00	(1.16)	1.93	(0.92)
Uses skills & rules to get meaning	2.57	(1.06)	1.68	(0.50)
Is enjoyable	4.13	(0.23)	3.97	(0.39)
Is meaning-getting activity	2.77	(1.17)	1.73	(0.76)
Involves conscious processing	3.37	(1.44)	2.13	(0.80)
Involves selection of strategies	2.00	(1.02)	1.28	(0.46)

Table 7

MANOVA for Concept Interviews

Source	df	Sum of Squares Cross Products: Con 1	Con 2	Con 3	Con 4	Con 5	Con 6	Con 7	Con 8	Con 9	Con 10	Multivariate F (df)	Univariate F
Constant	1	u_1	u_1									-----	Con 1: Involves Intentionality 3.13 / Con 2: Involves Effort 0.10 / Con 3: Is Systematic 3.40 / Con 4: Is Self-Directed 19.33***
		16.2										7.55** (10,9)	
		16.4	41.4										
		15.1	35.3	37.1									Con 5: Involves Problem Solving 5.15* / Con 6: Uses Skills to get Meaning 5.63* / Con 7: Is Enjoyable 1.30 / Con 8: Is Meaning-getting Activity 5.48*
Between groups	1	4.9	19.4	16.8	14.3								
		12.3	25.0	24.1	11.0	19.9							
		6.0	13.4	14.5	6.3	10.2	12.5						
		1.0	1.6	2.2	-.02	0.5	0.4	1.9					
		14.5	17.1	17.7	7.7	12.5	8.0	1.0	17.5				
		17.7	21.2	22.5	6.2	16.4	8.6	1.6	17.7	24.6			Con 9: Involves Conscious Processing 5.57* / Con 10: Involves Selection of Strategies 4.12*
		7.0	12.9	13.9	5.7	10.3	9.2	-.02	7.1	10.3	11.2		
		2.8											
		.8	.2										
		4.4	1.3	7.0									
		6.6	1.9	10.4	15.3								
Within groups	18	4.0	1.2	6.3	9.3	5.7							
		3.3	1.0	5.2	7.7	4.7	3.9						
		.6	.2	1.0	1.5	.9	.7	.1					
		3.9	1.1	6.1	9.0	5.5	4.6	.9	5.3				
		4.6	1.3	7.3	10.8	6.6	5.4	1.0	6.2	7.6			
		2.7	.8	4.2	6.3	3.8	3.2	.6	3.7	4.4	2.6		
Total	20												

* $p < .05$
** $p < .01$
*** $p < .001$

change when explanations about specific strategies are explicit. Whereas the differences were small, treatment students' growing knowledge of how to use skills as strategies may have helped them develop a different global view of reading than their treated control counterparts, leading them to begin thinking about reading as a sense-making activity that can be controlled by applying strategies. Although the absence of a baseline measure in this category demands some caution, it nevertheless seems that students who receive explicit explanations about using skills as strategies may come to understand that reading itself is a strategic act.

In sum, the results of the two awareness measures indicate that, when teachers are explicit in explaining reading skills as strategies, students report more awareness of lesson content and of the strategic nature of reading generally. This suggests that they are metacognitively aware and are mediating instructional information in qualitatively different ways than their counterparts in the treated control group.

Question 3: Is Explanation Related to Student Achievement?

The third question asked whether explicit teacher explanations are associated with more conscious student use of skills as strategies and with improved student achievement. Six measures were employed, two were traditional achievement measures and four were nontraditional achievement measures. All the achievement measures were aggregated by classroom.

Traditional Achievement Measures

Two traditional measures of student achievement are the reading part of the Stanford Achievement Test and the Michigan Educational Assessment Program. The SAT reading section consisted of two subtests, comprehension and word study. The pretest for the SAT was taken in Spring 1984 when the

students were at the end of the second grade. No significant difference on the SAT was found between groups at that time ($F(2,17) = 1.288$, $p = .301$). Even though no initial differences were found, to increase the power of the F-test for the 1985 SAT results, a multivariate analysis of covariance was performed, with the 1984 SAT results used as a covariate. Means and standard deviations can be found on Table 8.

As shown in Table 9 MANCOVA analyses indicated a significant overall difference favoring the treatment classrooms ($F(2,15) = 4.16$, $p < .05$). Univariate tests of significance found significant differences favoring the treatment group on the word study subtest ($F(1,16) = 8.09$, $p < .01$). No differences were found on the comprehension subtest ($F(1,16) = 0.37$, $p = .549$). The growth in the word study subtest (as opposed to the comprehension subtest) is sensible when one considers that the skills taught by the third-grade teachers in this study often emphasized identifying and understanding the meaning of individual words.

The second traditional measure of achievement used was the MEAP. It was given in the beginning of the fourth grade in the academic year following the study and gave each student's total reading score on the reading portion of the test. Consequently, a one-way analysis of variance procedure was used. The means and standard deviations are given in Table 10. Results revealed that students from the treatment group scored significantly higher than their treated control group counterparts ($F(1,18) = 5.723$, $p = .029$). This may indicate that students in treatment classrooms were more successful than students in treated control classrooms at maintaining the differences established in the year of the study.

In sum, the results of these two measures indicate that students who received explicit explanations of how to use skills as strategies achieved

Table 8

Means and Standard Deviations for
Stanford Achievement Test, Scaled Scores

		Pretest 1984			Posttest 1985	
Measure	Group	Mean	SD	Group	Mean	SD
Word study						
	Treatment	568.85	16.81	Treatment	595.19	17.74
	Treated control	556.75	18.35	Treated control	568.74	14.73
Comprehension						
	Treatment	553.64	21.30	Treatment	590.74	19.71
	Treated control	538.85	24.65	Treated control	585.86	19.77

Table 9

MANCOVA For Standford Achievement Test Comprehension and Word Study Subtests

Source	df	Sum of Squares Cross Product: 1985 SAT: Comprehension	Sum of Squares Cross Product: 1985 SAT: Word Study	Multivariate F (df)	Univariate F: 1985 SAT: Comprehension	Univariate F: 1985 SAT: Word Study
		u_1	u_1			
Constant	1			----	----	----
Between groups (eliminating covariates)	1	93.78		4.16* (2,15)	.37	8.09**
		-412.23	1811.97			
Covariates (eliminating design effects)	2	3010.30				
		1881.94	1205.34			
Within groups (eliminating covariates)	16	4006.43				
		351.38	3582.98			
Total	20					

* $p < .05$
** $p < .01$

Table 10

Means and Standard Deviations for
Michigan Educational Assessment Program

Group	Mean	SD
Treatment	20.81	4.618
Treated control	17.26	0.739

better on traditional achievement tests than students who received less explicit explanations. This finding is particularly important because previous studies of strategy instruction did not produce significant differences in standardized test results (Duffy, Roehler, et al., 1986; Paris, Cross, & Lipson, 1984).

Nontraditional Measures

The Supplemental Achievement Measure. The first nontraditional measure used was the Supplemental Achievement Measure. The SAMs were administered to target students on a schedule dictated by the respective teachers' coverage of basal text content. Consequently, the number of skills tested at any one administration varied from classroom to classroom, although there were no significant differences between classrooms in the total number of skills tested during the year. However, no two classrooms covered the same number of skills. Consequently, the analysis was based on the percentage of correct items aggregated by classroom across all the tests administered during the academic year.

The mean percentage of correct responses was calculated for the students of both the treatment teachers and the treated control teachers on both Part I and Part II of the measure, and a multivariate analysis of variance was performed to determine if there were significant differences in the mean scores of the two groups. Table 11 gives the means and standard deviations. As seen in Table 12, the MANOVA revealed that there was a significant main effect favoring the treatment group ($F(2,17) = 6.688$, 688, $p = .0072$). The Part II portion of the SAM contributed to this significance ($F(1,18) = 13.331$, $p = .0018$). There was no difference between groups for the Part I items ($F(1,18) = .18$, $p = .6739$).

Table 11

Means and Standard Deviations for
Supplemental Achievement Measures

Part	Group	Mean	SD
Part I[a]			
	Treatment	59.60	20.10
	Treated control	62.50	7.40
Part II			
	Treatment	56.28	12.30
	Treated control	39.62	7.60

[a]Denotes separate variance estimate.

Table 12

MANOVA For Supplemental Achievement Measures

Source	df	Sum of Squares Cross Products Part I	Part II	Multivariate F (df)	Univariate F Part I	Univariate F Part II
Constant	1	u_1 u_1		-----	----	----
Between groups	1	.004		6.69* (2,17)	0.18	13.33**
		-.024	.139			
Within groups	18	.413				
		-.098	.127			
Total	20					

* $p < .01$
** $p < .001$

The SAM results tend to support the basic hypothesis that students who receive explicit explanations about how to apply skills as strategies not only can do the task but also demonstrate they are conscious of how they performed the task. The fact that both the treatment and the treated control groups did equally well in performing the skill tasks themselves (the first part of the measure) but differed significantly in their ability to select appropriate statements regarding why they chose the answer they did (the second part) is particularly helpful in establishing that explicit explanations help low-group students become more consciously aware of how to use skills as strategies.

The Error Detection Test. The second nontraditional measure was the Error Detection Test. These data were analyzed by applying a formula developed by Paris, Cross, and Lipson (1984). Each student received a score for semantic error detection and for syntactic error detection. The scores were derived by subtracting incorrect answers from correct answers and dividing the results by the total number of correct answers. All data were aggregated by classroom. An analysis of covariance was used to determine differences between the two groups. The results indicate that scores were uniformly low across all students and that there were no significant dif ferences between treatment and treated control groups for semantic errors ($F(1,17) = 0.115$, $p = .738$) or syntactic errors ($F(1,17) = 0.269$, $p = .611$). It is hypothesized that the Error Detection Test was inappropriate for a student population consisting only of low-group third graders.

The Modified Graded Oral Reading Paragraph. The third nontraditional measure, the Graded Oral Reading Paragraph test was analyzed by examining target students' pre- and posttest verbal reports about how they

self-corrected and how they figured out the embedded words "grub" and "uncovered." Three researchers analyzed the verbal self-reports. For each administration of the GORP, researchers noted the number of verbal reports given for both self-corrections and the embedded words, whether the focus was on word recognition or word meaning, and the percentage correct for word-recognition and/or word-meaning strategies. Conventions for analyzing the verbal reports were developed by the researchers and guided their analysis. Reliability among the raters was .82.

Both a multivariate analysis of variance and a multivariate analysis of covariance using the word-recognition and word-meaning pretest scores as the covariate were used to determine differences between treatment students and treated control students. All student data were aggregated by classrooms. Table 13 shows the means and standard deviations. There were no significant differences on the pretest ($F(2,16) = .0967$, $p = .9083$). Although there were no pretest differences, a multivariate analysis of covariance was used for posttest scores, with pretest scores used as the covariate. As seen on Table 14 the MANCOVA indicated that there was a significant overall main effect on the posttest favoring the treatment group ($F(2,14) = 51.32$, $p < .001$). Univariate F-tests indicated that treatment students did better than treated control students on both the word-meaning subtest ($F(1,15) = 10.86$, $p < .005$) and on the word-recognition subtest ($F(1,15) = 105.783$, $p < .001$).

The results of the modified Graded Oral Reading Paragraph test suggest that low-group students who receive explicit explanations in how to use skills as strategies tend to use such strategies when reading text. Additionally, these results are significant because they provide further support for metacognitive awareness, that is, the students of treatment

Table 13

Means and Standard Deviations For
Graded Oral Reading Paragraph

Measure	Pretest Group	Mean	SD	Posttest Group	Mean	SD
Word recognition	Treatment	.56	.21	Treatment	.96	.06
	Treated control	.53	.39	Treated control	.51	.12
Word meaning	Treatment	.25	.25	Treatment	.65	.25
	Treated control	.26	.29	Treated control	.25	.28

Table 14

MANCOVA for Graded Oral Reading Paragraph:
Word Meaning and Word Recognition

Source	df	Sum of Squares Cross Product		Multivariate F (df)	Univariate F	
		Word Meaning	Word Recognition		Word Meaning	Word Recognition
Constant	1	u_1 u_1		----	----	----
Between groups (eliminating covariates)	1	.741	.931	51.32** (2,14)	10.86*	105.78**
		.831				
Covariates (eliminating design effects)	2	.169	.029			
		.034				
Within groups (eliminating covariates)	15	1.024	.132			
		.181				
Total	19					

* $p < .005$
** $p < .001$

teachers not only used the skills but, in the process of reporting how they used them, demonstrated conscious awareness reflecting the instruction provided by treatment teachers.

Magazine Test results. Researchers also noted Magazine Test scores. These criterion-based tests accompany the Houghton Mifflin basal series used by all the teachers in the study. Skills presented in the basal textbook were tested by five items on the Magazine Tests. Students had to get correct answers for at least four of the questions; if they did not meet this criterion, they were retested. For this study, only the scores teachers reported from the first administration of the test were used. The scores analyzed were for those skills that could be recast as reading strategies (70% of the skills tested). The target students' raw scores were converted to percentage correct and were aggregated by classroom. The mean percentage correct for the treatment classes was 88.25%; for the treated control classes it was 82.53%.

A separate variance estimate *t*-test was used because there were significant differences in variances between the two groups on this measure. The *t*-test indicated that the difference between these scores was significant ($t = 2.17$, $df = 13.6$, $p = .048$). The means and standard deviations are displayed in Table 15. These results are additional support for the hypothesis that low-group students receiving explicit explanations about reading strategies perform better on nontraditional measures than those who do not.

Summary Discussion of Achievement Results

The results of the achievement measures indicate that students of treatment teachers achieved better than students of treated control teachers on both traditional measures of reading achievement and on three of

Table 15

Means and Standard Deviations
For Magazine Tests

Group	Mean	SD
Treatment	88.25	29.69
Treated control	82.53	6.645

the four nontraditional measures. These results lend strong support to the hypothesis that explicit teacher explanation of the mental processing involved in using skills as strategies results in more conscious student use of skills as strategies and in improved achievement on a variety of measures.

Question 4: Is Explanation Related to Student Self-Perception?

An exploratory question asked whether explicit teacher explanations are associated with improved student self-perception of themselves as readers. Two measures of self-perception were employed: One was an indicant of students' perceived place in the reading group and the second was a measure of the students' perceived quantity of reading at school and in the home. It was hypothesized that treatment students who were taught to use skills as strategies would perceive themselves as better readers and that they would read more at home and at school as they improved their awareness and achievement.

Researchers used t-tests to analyze the responses of the three target students from each treatment and treated control classroom on both measures. The results indicate no significant differences between the groups in either the perceived place in the group or in the quantity of reading done at home or in school. Therefore, further analysis was not attempted.

The lack of significant differences may be explained by various factors. First, the two measures themselves may not have been sensitive indicators of self-perception. Second, the students may have responded not in terms of their actual self-perceptions but in terms of how they thought the interviewer expected them to respond. Finally, because the students were asked to compare themselves to others within their reading

group, one would not expect differences between groups. Perhaps measures which directly tap students' thoughts about their improvement in reading would be more appropriate.

Correlational Data

In addition to the primary data collected about each of the four research questions, correlations were computed among the data using Pearson Product Moment correlations. A variety of significant correlations were found (see Tables 16 through 20). No attempt is made to discuss all these correlations here. The correlations selected for discussion are those reflecting most directly the hypotheses of the study. Thus, the correlations between teacher explanation and student awareness are reported as a means for further illustrating the relationship between what the treatment teachers were taught to do and the hypotheses about increased students awareness. Additionally, correlations between student awareness and achievement as well as correlations among the various achievement measures are presented to illustrate the relationships among these outcome measures.

Correlations Between Teacher Explanation and Student Awareness

The correlations of teacher explanation scores with student awareness as measured by lesson interview scores yielded significant findings for the fourth, fifth, and sixth observations (see Table 16). As noted earlier, teacher explanation scores improved dramatically for the second observation and continued a modest but positive growth throughout the year. The fact that significant differences in student awareness of lesson content did not appear until the fourth observation suggests that

Table 16
Pearson Product Moment Correlations Between
Teacher Explanation and Lesson Interviews

Lesson Interview					
Observation 1	Observation 2	Observation 3	Observation 4	Observation 5	Observation 6
.156	.246	.126	.763**	.488*	.433*

* $p < .05$
** $p < .01$

student internalization of explanations about using skills strategically occurs over time.

Correlations Among Student Outcome Measures

There were several significant correlations between (a) the two awareness measures, (b) between the two awareness measures and the various achievement measures, and (c) among the various achievement measures. There was a strong, positive correlation between the lesson interviews and the total score for the concept interview at Observations 4 through 6. Because the concept interview score represented the sum of 10 categories, each of these separate categories were also correlated with the lesson interviews. As can be seen in Table 17, 8 of the 10 concept interview categories were positively associated with lesson interviews at the end of the year. In addition, close inspection of the table reveals that, with the exception of the category for "Reading is Enjoyable," the strength of the correlations between the concept interviews and lesson interviews increased across the six observations, lending further support to the finding that students gradually improve their awareness of lesson content as instruction progresses.

Regarding the relationship between lesson interviews measures and achievement measures, at the last observation the lesson interview scores were significantly correlated with four achievement measures: the SAT word study, Part II of the SAMs, the MEAP, and the GORP word meaning (see Table 18). These correlations suggest that at the end of the year ratings of student awareness of lesson content corresponds with their performance on both nontraditional (SAM) and traditional achievement measures (SAT).

The concept interviews were also significantly correlated with several of the nontraditional and traditional achievement measures (see

Table 17

Pearson Product Moment Correlations Between
Lesson Interview and Concepts Interview

	Lesson Interview					
Concepts Interview	Observation 1	Observation 2	Observation 3	Observation 4	Observation 5	Observation 6
Total	-.2003	.1326	.1963	.4445*	.3812*	.6720**
Involves intentionality	-.4030**	.0498	.1019	.1283	.1718	.2952
Involves effort	-.2279	.0927	.1694	.1391	.0726	.3311
Is systematic	-.2163	.2553	.0564	.2683	.2035	.5646*
Is self-directed	-.0436	.4621*	.2769	.4463*	.5379**	.7567**
Involves problem solving	-.3019	.2139	.2552	.3869*	.3604	.5799*
Skills/rules to get meaning	.0529	.0715	.4196*	.5745**	.3793*	.6587**
Is enjoyable	-.0862	.0079	-.0328	.1897	-.0337	.0404
Purpose is meaning getting	-.1941	-.0036	.1402	.2798	.3565	.4776*
Involves conscious processing	-.2272	.0009	-.0021	.3431	.2341	.4329*
Selection of strategies	-.1198	.2403	.2232	.4551*	.2647	.5760**

* $p < .05$
** $p < .01$

Table 18

Pearson Product Moment Correlations Between
Lesson Interviews and Stanford Achievement Test, Supplemental Achievement Measure, Magazine Tests,
Michigan Educational Asssessment Program, and Graded Oral Reading Paragraph

	Lesson Interviews					
Test	Observation 1	Observation 2	Observation 3	Observation 4	Observation 5	Observation 6
1985 SAT total	.1444	.0336	.1034	.3303	.5587**	---
1985 SAT-Word Study	-.0001	.3103	.2253	.4046*	.4431*	.7623**
1985 SAT-Comprehension	-.0548	-.1409	.2881	.0214	.4909*	.2998
SAM Total	-.2543	.2538	.1343	.3387	.5597**	---
SAM-Part I	-.3929*	-.4177*	.1929	.0805	-.0793	-.2399
SAM-Part II	.1981	.2905	.2382	.3886*	.5154**	.7110**
Magazine total	-.2942	.1396	-.2666	.0628	.4323*	.3766
MEAP	.3482	-.0103	.3865*	.4813*	.5658**	.6443**
GORP-Word recognition	.2315	.2364	.4242*	.4221*	.1869	.2576
GORP-Word meaning	.0024	.3467	.2432	.3346	.2600	.4428*

* $p < .05$
** $p < .01$

Table 19). The overall concept rating was significantly correlated with the 1985 SAT Word Study subtest, Part II of the SAMs, the MEAP score, and the word-recognition and word-meaning categories of the GORP. The individual concept categories that were most often associated with achievement measures were those categories labeled "self-directed," "uses skills and rules to get meaning," and "selection of strategies." This suggests that certain aspects of a global conceptualization of reading are associated with achievement in reading. The several positive correlations among the nontraditional and traditional achievement measures (see Table 20) suggests a strong relationship among these measures.

Summary of Correlational Findings

The significant correlations between teacher explanation and student awareness, and among student scores on lesson interviews, on concept interviews, on nontraditional achievement measures, and on traditional achievement measures supports the findings of the basic research questions. Improved teacher explanation is associated with student metacognitive awareness; this awareness, in turn, is associated with improved reading performance on a variety of traditional and nontraditional achievement measures.

Implications

Major Implications

This study documents the importance, during low-group reading instruction, of explicit teacher explanations of the mental processing associated with cognitive tasks. Two major implications emerge.

First, explanation of mental processes is established as a component of instruction. This is important because explanation of mental processes

Table 19

Pearson Product Moment Correlations Between Concepts Interviews and Stanford Achievement Test, Supplemental Acheivement Measure, Magazine Test, Michigan Educational Assessment Program, and Graded Oral Reading Paragraph

Test	Involves Intentionality	Involves Effort	Is Systematic	Is Self-Directed	Invovles Problem Solving	Skills/rules to Get Meaning	Is Enjoyable	Purpose Is Meaning Getting	Involves Conscious Processing	Selection of Strategies	Total (overall score)
1985 SAT Total	.1133	.0061	.1989	.4679*	.2450	.3258	-.1366	.2023	.1903	.4420*	---
1985 SAT Word Study	.0797	.0702	.2788	.5045*	.3362	.3904*	-.1120	.1818	.1362	.4720*	.4109*
1985 SAT Comprehension	.2343	.1582	.2495	.3771	.2697	.3864*	.0742	.2900	.1869	.3994*	.2802
SAM Total	.1354	.0683	.4475*	.6819**	.3227	.5804**	.1997	.4597*	.3471	.3961*	---
SAM-Part I	-.0384	.0680	-.2182	-.1610	-.1274	-.0737	.0042	.0551	-.1341	-.2156	-.0988
SAM-Part II	.2750	.2156	.5571**	.7636**	.4803*	.6447**	.2756	.5525**	.4568*	.4384*	.5693**
Magazine Total	.4098*	-.1579	.0991	.4459*	.1517	.1272	-.0469	.3710	.2263	.1862	-.0152
MEAP	.1503	.1704	.3535	.5425**	.3902*	.7245**	-.0747	.3492	.2427	.4573*	.4140*
GORP-Word Recognition	.1376	.0037	.1776	.5779**	.3319	.4105*	.1999	.2903	.3019	.3441	.4123*
GORP-Word Meaning	.2624	.1787	.2413	.5449**	.4678**	.2310	.0098	.1292	.2666	.4038*	.4160*

* $p < .05$
** $p < .01$

Table 20

Pearson Product Moment Correlations Between
Stanford Achievement Test, Supplemental Achievement Measure,
Magazine Tests and Michigan Educational Assessment Program

Test	1985 SAT-Word Study	1985 SAT-Comprehension	SAM-Content	SAM-Process	Magazine Total	MEAP
1985 SAT-Word Study	1.0000	.3744	-.1306	.4163*	.4266*	.3509
1985 SAT-Comprehension		1.0000	-.0212	.3201	.3290	.3438
SAM-Content			1.0000	-.3303	-.2105	-.0650
SAM-Process				1.0000	.3847	.7417**
Magazine Total					1.0000	.3110
MEAP						1.0000

* $p < .05$
** $p < .01$

is not emphasized in instructional research generally (see Brophy & Good, 1986; Rosenshine, 1986) or in reading instructional research particularly (see Au, 1979; Palincsar & Brown, 1984; Paris, Cross & Lipson, 1984; Pearson, 1985). In fact, reading researchers such as Tierney and Cunningham (1984) suggest that explaining mental processes may be "fraught with danger." This study suggests that such fears are groundless, that mental acts can be explained and that such explanations result in better student outcomes than when a teacher employs the more common practice of demonstrating a cognitive task as students watch, then coaxing them to do the same thing, and then assessing to determine whether or not they did it.

The second implication focuses on the student's role in instruction. By focusing on student awareness as well as achievement, the study highlights the student's role as a mediator of instructional information and suggests that this mediational process takes time, at least with low-group third graders. Rather than immediately absorbing instructional information, students restructure the information on the basis of past experiences and their goals in the instructional setting. Gradually, as teachers present explanations across the academic year, students modify their understandings in the ways intended by the teacher (Duffy & Roehler, 1986b). This gradual development is supported by the increasing awareness scores of treatment students over the academic year. These increasing awareness scores, in turn, are associated with explicitness of the teacher's explanations. The more consistent the teacher is in providing explicit explanations throughout the academic year, the more likely it is that students will mediate instructional information accurately and, ultimately achieve the intended goal.

In sum, the combination of the student's mediational role and the effects of explicit teacher explanations suggests a model for instruction (Duffy, Roehler, Meloth, & Vavrus, 1986). This model states that the most efficient way to instruct is to provide instructional information as explicitly as possible to increase the possibility that the students will understand what is intended by the teacher, with a causal relationship possibly existing between the teacher's explanation and the degree of student awareness and between student awareness and student achievement. In short, the better the explanation, the greater the awareness; the greater the awareness, the better the achievement.

Additional Implications

In addition to the major implication noted above, the study suggests three other implications: implications regarding the nature of explanation, implications regarding the complexity of cognitive learning, and methodological implications.

The Nature of Explanation

Explanation is usually conceptualized as modeling; the explanation is often thought to be over when the modeling ends. This study suggest that this view of explanation is too narrow. The best explainers continue explanations throughout the lesson, elaborating on the lesson content in response to the restructured understandings students develop as they mediate what the teacher says (Duffy & Roehler, 1986b, 1987; Duffy, Roehler, Meloth, & Vavrus, 1986). Those teachers who continue explanations beyond modeling by responsively elaborating on students' restructured understandings are more effective than teachers who simply provide explicit models. Consequently, an important implication of this study

is that it broadens the traditional definition of explanation, suggesting that simply "front-loading" lessons with an explicit model is not enough.

Cognitive Learning

Regarding cognitive learning, this study documents its complexity in two ways. First, low-group third-grade students do not immediately respond to instruction on cognitive tasks. For instance, in the study reported here it took until Observation 4 to achieve significant differences in treatment students' awareness of lesson content regarding the mental processes associated with using skills as strategies, despite very explicit instruction in Observations Two and Three. Instead of immediate awareness, awareness increased gradually over the course of the academic year. This suggests that, when instruction for cognitive outcomes such as those associated with this study is consistent and continuous, low-group third-grade students gradually develop the desired understandings.

Second, traditional achievement measures, when used alone, are generally inadequate for measuring cognitive learning outcomes such as strategic employment of reading skills. While the two traditional standardized achievement measures employed in this study resulted in significant growth favoring treatment students, the nontraditional measures provided the most direct evidence that students were indeed metacognitively aware of reading strategies and of their cognitive processing when using strategies. Consequently, while short studies and traditional paper-and-pencil measures are often adequate in instructional studies where the outcomes emphasize memory rather than reflection, the complexity of cognitive learning such as strategy usage demands that such instructional studies be longer and include nontraditional measures of performance.

Methodological Implications

Finally, this study suggests three methodological implications. First, it is a strong argument for naturalistic research that is conducted in real classrooms where the real constraints of teaching influence the instructional innovation. In any other setting, one never knows whether the innovation can be implemented by real teachers or not. Second, as noted earlier, instructional research should be longitudinal, especially when the desired outcomes are cognitive understandings, because studies of less than an academic year in duration are less likely to capture student changes in strategy use. Finally, staff development is crucial in instructional studies in which the innovation being studied involves more than proceduralized instructional routines. When the intervention focuses on major kinds of decision making such as those required of the teachers in this study, a carefully constructed staff development model is necessary to ensure that teachers change their instructional behavior enough to foster differences in student outcomes. For a detailed discussion of the staff development implications, see Putnam, Roehler, and Duffy (1987).

Future Directions

Whereas the findings of this study are relatively conclusive, it has nevertheless generated six new questions about instruction. First, this study does not establish explanation as a universal feature of instruction. If the outcome is metacognitive use of skills (as it is in the studies reported here), explicit verbal explanation may be quite appropriate; if the outcome is affective appreciation for the aesthetics of literature, explicit verbal explanation may be quite inappropriate. If the outcome is sense making based on conscious self-monitoring of the text's meaning, strategic application of skills may be quite appropriate;

if the outcome is automaticity in instantly recognizing high-frequency words, metacognitive approaches may be quite inappropriate. Hence, there is a relationship between the outcome sought and the appropriate form of instruction. More research needs to be conducted to determine when explanation is most appropriate.

Second, because of the gradual way in which students' understandings develop, a longitudinal study of the impact of teacher explanation is needed. The data suggest that the effects of consistent and explicit explanations about the mental processes involved in using skills as strategies would be even more effective if students received such instruction for longer than one academic year.

Third, as important as explicitness about mental processing apparently is, the descriptive data from this study suggest that it is not enough to simply be explicit. Instead, there are qualitative dimensions to the instructional interactions that occur during explanations which cause instruction to be more or less effective (Duffy & Roehler, 1986b; Duffy, Roehler, & Rackliffe, 1986). Additional studies must be conducted to identify these qualitative dimensions and, ultimately, to test test them out in experimental studies.

Fourth, techniques for measuring outcomes associated with strategic reading must be further refined for use in future instructional studies. Whereas the measures of student awareness and student cognitive processing used in this study (such as the lesson interview, the concept interview, the Supplemental Achievement Measure, and the modified Graded Oral Reading Paragraph) effectively discriminated between treatment and treated control

students, improvements in each of these measures are needed. Recommendations regarding these changes are provided elsewhere (Duffy, Roehler, et al., 1985).

Fifth, more descriptive work needs to be done regarding what to say to students about the cognitive processing one does when applying skills strategically. Little information is available regarding the universal features of such reasoning or whether the idiosyncratic nature of cognitive processing precludes any universal features. Consequently, there is currently little of a specific that can be confidently included in explanations about mental processing. More study of the qualitative dimensions of teacher's descriptions would help alleviate this problem.

Finally, interview data from participating teachers suggest that there is wide variation in teachers' abilities to conceptualize both reading as a strategic process and explanation as the provision of substantive information (Duffy & Roehler, 1986a). In a broader sense, these data suggest that teachers' perceptions of their roles as teachers are influenced by contextual conditions as well as by their conceptualizations (Duffy, Roehler, & Putnam, 1987). Both the teachers' conceptions and the instructional context have an impact on effectiveness in creating student outcomes. This relationship needs to be explored more fully in future studies.

Conclusion

This study is important for two major reasons: One is instructional and the other is methodological. Instructionally, it establishes the importance of explaining mental operations. Teachers who explicitly explain the mental acts involved in using skills strategically have more success with low-group students. Consequently, explanation of mental

processing is a component of instruction which must be carefully developed and consciously employed. Methodologically, this study establishes the potential for studying instruction in natural settings. Instead of conducting instructional studies using (a) a researcher as the teacher, (b) an adjunct curriculum, and (c) limited lengths of time, this study conducted instructional research using regular classroom teachers and the regular mandated curriculum for the entire academic year. While such naturalistic experiments are difficult and costly, their ecological soundness adds a unique dimension of validity to the results.

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Appendices

Appendix A

Management Principles from the First-Grade Reading Study[1]

a. Teacher provides a standard and predictable signal to get attention?

b. Teacher faces class with small group while students face away?

c. Overview of what is to come is provided?

d. New words and sounds are presented before story is read?

e. Students repeat new sounds or words until said satisfactorily?

f. Teacher presents information?

g. Teacher works with individual students as they practice?

h. Teacher uses a pattern for turn taking?

i. Teacher occasionally questions a student about another student's response?

j. Teacher calls on volunteers only when personal experiences or opinions are related?

k. When call outs occur, teacher reminds the student that everyone gets a turn and he/she must wait?

l. Teacher avoids leading or rhetorical questions?

m. Teacher provides wait time for questions?

n. Teacher provides feedback about incorrect answer?

o. Teacher provides:

   1. answer if answer can't be reasoned out? and
   2. clues if answer can be reasoned out?

p. Teacher makes sure all students hear and understand correct answers?

q. Teacher provides praise in moderation?

r. Teacher provides specific criticism and specification of correct alternatives?

[1] From L. Anderson, C. Evertson, & J. Brophy. (1979). An experimental study of effective teaching in first-grade reading groups. Elementary School Journal 79, 193-223.

Appendix B

1984-85 Teacher Explanation Rating

November 15, 1984

I. Information Presented about the Strategy

1. Rate how explicit the teacher is in informing students that the task to be learned is a strategy for solving a problem encountered in reading.

0--the teacher makes no statement about what is to be learned (total absence of...).

1--the task is named/labeled but there is little information beyond "we will learn about prefixes..."

2--the task is named/labeled and there is some elaboration beyond "we will learn about prefixes..."

3--the task is described as an adaptive, flexible strategy ("we will learn how to...") but it is not an exemplar.

4--an exemplary presentation of the task is an adaptive, flexible strategy to solve a problem encountered when reading.

2. Rate how explicit the teacher is in informing students that the strategy is useful as they read.

0--there is no statement of where the skill would be used (total absence of...).

1--the teacher only mentions that the skill is generally useful or useful in reading but does not specify why or when.

2--the usefulness of the task is related to the future ("when you get in sixth grade...") or is vague or general in stating why or when it is related to particular text ("it helps you get information...")

3--the immediate usefulness of the skill is illustrated with a specific reference to a particular example but it is not an exemplar.

4--an exemplary statement of the immediate usefulness of the skill in reading connected text in which one or more concrete examples are used to illustrate.

3. Rate how explicit the teacher is in telling students how to decide which strategy to select for use when encountering a problem in readig.

   0--there is no mention that students will have to select a strategy to solve the problem (total absence of...).

   1--the teacher mentions that this skill can be used to solve a problem but provides no additional information.

   2--the teacher mentions that this skill can be used to solve a problem and provides some information about how to choose the appropriate strategy.

   3--the problem situation is explicitly specified and how to select an appropriate strategy is emphasized but it is not an exemplar.

   4--an exemplary statement of how to recognize that problem exists and how to select the appropriate strategy.

4. Rate how explicit the teacher is in telling students how to perform the strategy to solve the problem when reading real text.

   0--there is no explanation of how to perform the strategy (total absence of...).

   1--there is an explanation but it is stated as a rule to be memorized or as a procedure to be recalled and no examples are provided.

   2--the teacher talks about the rule and/or procedure as routine to be applied without variation and examples are provided.

   3--the teacher shows students how to follow mental steps and a sequence in a flexible, adaptive manner but it is not an exemplar.

   4--an exemplar description in which the teacher shows students how to follow mental steps and a sequence flexibly and adaptively when performing the strategy.

Appendix B (cont.)

II. The Means Used to Present the Information

1. Rate how explicit the teacher is in introducing the lesson.

   0--the teacher makes no introductory statements or overview regarding the lesson (total absence of...).

   1--the teacher makes an introductory or overview statement about what is to be learned, but does not mention why or how.

   2--the teacher makes an introductory or overview statement about what is to be learned and either why or how (but not both).

   3--the teacher makes an introductory or overview statement that includes information about what, why and how, but it is not an exemplar.

   4--the teacher makes an exemplary introductory or overview statement about the strategy to be learned, the "real text" situation in which it will be applied and what to attend to when using it.

2. Rate how explicit the teacher is in modeling for students the mental steps in identifying the problem, selecting the strategy, and applying the strategy.

   0--the teacher does not model how to do the task at any point in the lesson (total absence of...).

   1--the teacher models procedural use of a rule.

   2--the teacher models the steps to be followed as a procedure but does not make the invisible visible.

   3--the teacher models mental steps in using the strategy adaptively (makes the invisible visible) but used artificial text samples or otherwise is not an exemplar.

   4--the teacher provides an exemplary model of how to use mental steps in applying the strategy adaptively to a sample of natural connected text.

Appendix B (cont.)

3. Rate how well the teacher shifts the instructional interaction from teacher regualtion of the strategy to student control of the strategy.

   0--the teacher does not provide any guided practice (total absence of...).

   1--the teacher requires the students to provide answers to tasks which presumbly call for the use of the skill (in a recitation or assessment mode).

   2--the teacher moves from teacher regulation to student regulation but the emphasis is on answers rather than student mental processing.

   3--the teacher moves from teacher regulation to student control and emphasizes student mental processing rather than answers, but it is not an exemplar.

   4--the teacher provides an exemplary series of trials which are characterized by increased student mental processing, but much teacher assistance early in the lesson, by teacher monitoring of students use of mental processes, and by making reference to the monitoring of student responses in asking for subsequent responses.

4. Rate how well the teacher elicits responses which require students to verbalize how they arrive at their answer.

   0--the teacher does not elicit student responses to the skill of the task (total absence of...).

   1--the teacher elicits right answers and does not require students to state how they know the answer.

   2--the teacher requires students to state how they got answers but focuses on precedural recall rather than knowing how to get the answer.

   3--the teacher requires students to explain how they got the answer but has individual students verbalize individual steps rather than having each student verbalize all the steps, or otherwise fail to be an exemplar.

   4--the teacher's elicitations are exemplary, requiring each student to verbalize all the mental steps used in applying the skill strategically.

5. Rate how well the teacher brings closure to the observed lesson (or lesson segment).

   0--there is no evidence of closure to the lesson (total absence of...).

   1--the teacher ends the lesson but makes no summary statement about the skill being taught.

   2--the teacher makes a summary statement but does not include all information (the what, the why and the how).

   3--the teacher ends the lesson with a summary statement about what was learned, why it was learned and how to do it (but does so without student involvement or otherwise fails to be an exemplar).

   4--the teacher provides exemplary closure by involving students in summarizing and/or in reviewing, or in using the skill strategically in natural connected text, or by reminding them that it is in such natural connected text that the skill will be used.

III. Intra- and Inter-Lesson Cohesion

1. Rate how successful the teacher is in bringing a sense of cohesion to the lesson.

   0--there is no recognizable sequence or cohesion within the lesson (total absence of...).

   1--the teacher's lesson has some evidence of a logical sequence but there are frequent inconsistencies and breaks.

   2--the teacher's lesson reflects a logical progression but contains some inconsistencies or breaks in lesson focus or breaks in activity flow.

   3--the lesson has structure, is consistent, is focused and flows smoothly but is not an exemplar.

   4--the teacher provides a lesson which is exemplary in terms of internal structure, consistency, focus and flow.

Appendix B (cont.)

2. Rate how successful the teacher is in communicating a sense of cohesion with past and future lessons.

   0--there is not recognizable connection to past and future lessons (total absence of...).

   1--the teacher refers to past lessons but makes no reference to future lessons or refers to future lessons but makes no reference to past lessons.

   2--the teacher refers to past and future lessons but there is little evidence of cohesion.

   3--the teacher refers to past and future lessons, achieves some cohesion across lessons, but it is no exemplar.

   4--the teacher provides an exemplary lesson in terms of its cohesion across lessons.

Appendix C

Rating Pupil Awareness

Determine pupil awareness by judging pupil response to the three interview questions and all subsequent elaborating probes which the researcher may have used in conjuction with each question. The criteria for pupil awareness follow.

1. A highly rated response to the question about "what" was being taught must include a specific reference to the process involved in completing the task and an example:

   0--No awareness (student does not know, is inaccurate or supplies a response that does not make sense).
   1--the response is a non-specific reference to the task ("We are learning about words.").
   2--the response refers to the name of the specific task which can be done successfully if the process is applied correctly or is an example of what can be done ("We are learning ou words.").
   3--the response includes a specific reference to the process being learned ("We are learning how to sound out ou words.").
   4--the response includes a specific reference to the process and an example ("We are learning how to sound out ou words, like in out.").

2. A highly rated response to the question about "why" or "when it would be used" must specify both the context in which it will be useful and what he/she is able to do in that context:

   0--no awareness or includes no reference to the specific task ("I'll get smarter" or "it'll help me when I grow up.").
   1--the response is not specific to the task but is related to reading language generally (I'll read better.").
   2--the response refers to an appropriate general category but no to the specific use for what was taught ("I can sound out words better.").
   3--the response includes specific reference to what he/she will be albel to do but not the context in which it would be useful (I can sound out ou words.").

   OR

   specifies the context in which it would be useful but not what he/she will be able to do (I can use this when I come upon an unknown word in my book").
   4--the response includes both what he/she will be able to do and the context in which it is useful ("When I come upon an unknown ou word in my library book, I'll be able to sound it out.").

Appendix C (cont.)

3. A highly rated response to the question about "how do you do it" must include an example of how one does the mental processing associated with successful completion of the task or an appropriate sequence of steps to be followed.

0--no awareness.
1--the response is not specific to the mental processing to be used ("I'll sound the word out.").
OR
is merely an example that does not illustrate conscious understanding of the mental processing to be used ("loud").
2--the response refers to features to attend to but not to the way they are used in doing the mental processing ("I say, 'l-ou-d'").
3--the response identifies some of the features to attend to and some understanding of the mental processing ("If I see a word that has ou in it, I say the sound of ou").
4--the response includes a sequence of the mental processing or a specific example of the mental processing (when I meet an unknown word such as loud, I think first...and then...etc.).

Appendix D

Skills tested with the Supplemented Achievement Measures (SAMs)

Skylights[1]

Noting important details
Decoding clusters
Getting the main idea
Noting correct sequence
Multi-meaning words
Understanding cause & effect
Categorizing
Commas in series
Predicting outcomes
Drawing conclusions
Recognizing word parts
Compound words
Recognizing base words

Towers[2]

Drawing conclusions
Getting the main idea
Clusters
Predicting outcomes
Multi-meaning words
Understanding cause & effect
Compound words
Noting correct sequence
Categorizing
Noting important details

Spinners[3]

Recognizing base words
Drawing conclusions
Common syllables--ly, ful, less
Recognizing compound words
Noting important details
Using context to get meaning--familiar words
Contractions
Using prefixes to get word meaning
Using context to get meaning--unfamiliar words
Using suffixes to get word meaning
Categorizing
Getting the main idea
Predicting outcomes
Noting correct sequence

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[1] W.K. Durr, J.M. LePere, J.J. Pikulski. (1983). Boston: Houghton Mifflin.
[2] W.K. Durr, J.M. LePere, J.J. Pikulski, & R.H. Brown. (1983). Boston: Houghton Mifflin.
[3] W.K Durr, J.M. LePere, J.J. Pikulski, & R.H. Brown. (1983). Boston: Houghton Mifflin.

Appendix E

Error Detection Test[1]

Name_____

Reading Teacher_____

Date_____

The Parade

Mary was going downtown to watch the parade. She skipped and along ran street the because she could hardly wait to get there. She was late so she found a good place to watch the parade.

Pretty soon she could hear the music of the bands coming down the main street. The men of the first band dressed were in scarlet, with white feathers in their hats. The men of the second band were clad in dark blue and were playing loudly. They had red feathers in their caps.

After them came the trucks loaded with dirt and cement. Then there were cars filled with officers and their friends. Mary was sad because there was no music in the parade. Next came a company of in soldiers dark green uniforms. Last of all was another band dressed in white suits and yellow feathers

[1] From S. Paris, D. Cross, & M. Lipson (1982). Informal strategies for learning: A program to improve children's reading awareness and comprehension. Journal of Educational Psychology, 76, 1239-1252.

Appendix F

Modified Graded Oral
Reading Paragraph (GORP)

Note: Adapted from W. Durr. (1983). Placement test, Houghton Mifflin Reading Series. Boston: Houghton Mifflin.

1.	earth	hour	fire	egg	catch
2.	king	pass	act	milk	blew
3.	touch	form	plane	eight	reach
4.	thick	base	warm	tale	final
5.	port	fresh	train	women	spoon
6.	check	island	complete	notice	usual

When the young skunks were eight weeks old, the mother skunk took them on their first hunt. It was at night. Skunks hunt at night and sleep in the day.

The young skunks followed along behind their mother in a single line, their bushy tails held up high. Skunk Baby was the last in line.

The mother skunk took her family along a path at the edge of the woods. She was taking them to the pond in the meadow.

The moon was shining down through the trees. The mother skunk stopped by a log. With her sharp, strong claws, she dug at the rotting wood.

She uncovered some small grubs and snapped them up. Skunk Baby tasted a fat grub and licked his lips.

Suddenly the skunks heard a strange noise at the other end of the log. A round, bristly-looking animal walked past.

The mother skunk did not even look at the old porcupine. She was not afraid of him. He was not an enemy. She gave her young a sign to follow her. And off the family waddled down the path and toward the pond.

From the pond came the song of the frogs. Under rocks and leaves, crickets rubbed their wings together, making a cheerful, chirping sound.

The frogs' singing grew louder. The skunks were almost at the pond.

Suddenly there was a soft, swishing sound overhead. A great horned owl swooped down.

The owl was a dangerous enemy! The mother skunk stamped her front feet. Her family quickly scrambled under a thorny bush.

The branches were so full of sharp thorns that it was impossible for the owl to land. Soon it hooted and flew away.

When she was sure it was safe, the mother led her family to the pond. They walked to the edge and drank the cool water.

Appendix G

Sample Magazine Test[1]

G

TEST ONE
Multi-Meaning Words

Read each numbered sentence. Think about the meaning of the word in heavy black letters. In one of the next two sentences, that word means the same as it does in the numbered sentence. Put an X in front of that sentence. The first one shows you how.

★ Helen has a fish for a pet.

X A cat makes a good pet.

____ I pet the dog on the head.

1. We had our picnic in the park.

____ Park your car on this street.

X The park is a place to play.

2. The school bell began to ring.

X Did the telephone ring?

____ I put a ring on my finger.

3. Watch where you are going!

X Did you watch TV?

____ Boris got a new watch.

4. We made a trip to the beach.

____ Don't trip on the rock.

X Greg went on a long trip with his aunt.

5. Ours is the second house on the right.

____ A second is a very short time.

X Gina is the second person in line.

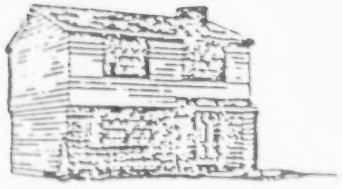
UNIT 6 SKILL C1-1c

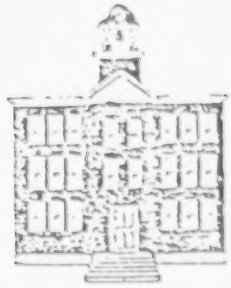
Number Correct ___ __

[1] From W. Durr, J. M. LePere, J.J. Pikulski, & R.H. Brown. (1983). Towers. Boston: Houghton Mifflin.

Appendix H

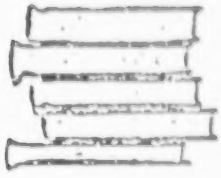
Amount of Reading Measure





At home I read _____

At school I read _____



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Student _____ ___

Teacher Code _____ ___

Date _____ ___

Researcher Code _____ ___